

REMARKS

Claims 1-9, 11, 12, 14-20, and 33-40 were pending. Claims 3, 6, 16, 39, and 40 have been amended. Claims 4, 5, and 15 have been canceled. Claims 1-3, 6-9, 11, 12, 14, 16-20, and 33-40 are pending. Applicant respectfully requests entry of the amendments to claims 3, 6, 16, 39, and 40. The amendment to claim 3 conforms the claim to the disclosure. Claims 6 and 16 have been amended to correct dependency on claims canceled by this response. Claims 39 and 40 have been amended to remove process-related limitations from apparatus claims. The amendments are submitted to improve the form of the claims, and entry of the amendments is urged.

Claims 1-9, 11, 12, 14-20, and 33-40¹ stand rejected under 35 U.S.C. § 103(a) as being unpatentable over applicant's admitted prior art (APA) in combination with U.S. Pub. No. 2002/0062923 in the name of Forray. Applicant respectfully requests reconsideration of this rejection.

A. Claim 1:

Claim 1 recites a semiconductor device assembly comprising "a solder mask over a substrate," "a die," "conductive paths connecting contacts on said die with contacts in said substrate," and "a partially-cured adhesive layer adhering said die to said solder mask." The partially-cured adhesive layer comprises "one or more adhesive components that cure at or below 100°C." Advantages of the recited assembly include fewer defects from outgassing during fabrication and reduced fabrication time.

1. The Admitted Prior Art (APA):

The APA teaches a semiconductor device 10 as shown in FIG. 1. Semiconductor device 10 is fully assembled and mounted on a printed circuit board. Semiconductor device 10 is described in the present specification. Manufacturing steps for

¹ Claims 31 and 32 are discussed as having been rejected in the outstanding Office Action, but are not pending, having been canceled by applicant's amendment dated September 20, 2004.

assembling the semiconductor device 10, discussed on page 1, lines 12-14, are as follows: "...the adhesive material is applied to the chip and allowed to cure *prior to* deposition of the solder mask." The APA as shown and described contains no teaching or suggestion of a semiconductor device having "a solder mask over a substrate," "a die," "conductive paths connecting contacts on said die with contacts in said substrate," and "a *partially*-cured adhesive layer adhering said die to said solder mask." Instead, the APA leads one away from such a construct as recited in claim 1, teaching those of ordinary skill instead to cure the adhesive material before depositing a solder mask.

The APA further discloses that "currently utilized adhesive materials cure at a temperature in excess of 150°C." Consequently, the APA does not teach or suggest a semiconductor device having "a solder mask over a substrate," "a die," "conductive paths connecting contacts on said die with contacts in said substrate," and "a partially-cured adhesive layer adhering said die to said solder mask," the partially-cured adhesive layer comprising "one or more adhesive components that cure at or below 100°C."

2. Forray:

Forray does not cure the deficiencies of the APA. Forray discloses an adhesive capable of being used in semiconductor device assembly. Forray does not disclose or suggest a semiconductor device having "a solder mask over a substrate," "a die," "conductive paths connecting contacts on said die with contacts in said substrate," and "a partially-cured adhesive layer adhering said die to said solder mask."

The Office Action states, without support, that it "would have been obvious to one of ordinary skill in the art to form the device of the admitted prior art with the adhesive of Forray." Applicant respectfully submits that this statement, even if assumed to be true, is inapposite: The APA device shown in FIG. 1 and described in the present application is not the device recited in claim 1. More specifically, the semiconductor device 10 does not feature "partially-cured adhesive." The adhesive in the APA device was cured prior to depositing the solder mask. Also, the semiconductor device 10 does not feature a

partially-cured adhesive layer comprising “one or more adhesive components that cure at or below-100°C.”

Applicant notes further that the proposed combination would not result in the invention recited in claim 1. Instead, assuming an ability to properly combine the APA with the teachings of Forray, produced would be a semiconductor device with cured adhesive. There is no teaching or suggestion in the APA and Forray, whether taken individually or combined, to produce an assembly of “a solder mask over a substrate,” “a die,” “conductive paths connecting contacts on said die with contacts in said substrate,” and “a partially-cured adhesive layer adhering said die to said solder mask.” According to both the APA and Forray, any device produced from the proposed combination, and having the three features of “a solder mask over a substrate,” “a die,” and “conductive paths connecting contacts on said die with contacts in said substrate,” would have a cured adhesive. There is no teaching or suggestion, absent applicant’s disclosure, that the result of such a proposed combination would have “a partially-cured adhesive layer adhering said die to said solder mask.”

3. Published Case Decisions and Opinions:

The rejection based on the APA and Forray purportedly is buttressed by several published case decisions and opinions cited in the Office Action. Applicant respectfully disputes their relevance, however. More specifically, two USPQ cases (In re Casey 152 USPQ 235, 238 (CCPA 1967); In re Finsterwalder 168 USPQ 530 (CCPA 1971)) and two USPQ2d cases (Ex parte McCollough 7 USPQ 2d 1889, 1891 (PBAI 1988); Ex parte Wikdahl 10 USPQ 2d 1546, 1548 (BPAI 1989)) are cited on page 5 to support the proposition that “the manner in which an apparatus operates is not germane to the issue of patentability.” The statement, though it may be true, is not germane to claim 1’s patentability, because claim 1 does not rely on or describe “the manner in which an apparatus operates.”

Further, claim 1 is not an example of “expressions relating to apparatus contents during an intended operation,” nor does claim 1 “attempt to distinguish over the prior art in terms of function rather than structure.” As stated in the Office Action with reference to *Hewlett-Packard Co. v. Bausch & Lomb, Inc.* (*Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 15 USPQ 2d 1525, 1528 (Fed Cir. 1990)), “apparatus claims cover what a device is, not what a device does.” Applicant respectfully submits that the limitation recited in claim 1 of a partially-cured adhesive describes the device, not its function. Claim 1 contains no description of the function of the adhesive, or any other feature of the claimed invention.

Claim 1 is patentable over the proposed combination of the APA and Forray. Claims 2, 3, 6-9, 11, 33, 34, 37, and 39 depend from claim 1, and are patentable over the cited prior art for at least the same reasons.

B. Claim 12:

Claim 12 recites a semiconductor device assembly comprising “a solder mask on a substrate,” “a die,” and “electrical contacts on said substrate and said die.” Each contact on the die is “connected to a respective said contact on said substrate,” and the electrical contacts are “devoid of contamination caused by outgassing from said solder mask.” The assembly features “a partially-cured adhesive layer affixing said die to said solder mask, said partially-cured adhesive layer containing one or more adhesive components that cure at or below 100°C.”

The APA teaches that semiconductor device 10, shown in FIG. 1, has “adhesive material...applied to the chip and allowed to cure *prior to* deposition of the solder mask.” The APA further discloses that “currently utilized adhesive materials cure at a temperature in excess of 150°C.” Consequently, the APA does not disclose, and instead teaches away from, a semiconductor device assembly featuring “a solder mask on a substrate,” “a die,” and “electrical contacts on said substrate and said die,” each contact on the die being “connected to a respective said contact on said substrate,” and “a *partially*-cured adhesive

layer affixing said die to said solder mask, said partially-cured adhesive layer containing one or more adhesive components that cure at or below 100°C.”

Forray does not cure the deficiencies of the APA. Forray discloses an adhesive that can be used to assemble semiconductor devices. Forray does not disclose or suggest in combination with the APA a semiconductor device assembly having “a solder mask on a substrate,” “a die,” “electrical contacts on said substrate and said die,” each contact on the die “connected to a respective said contact on said substrate,” and “a partially-cured adhesive layer affixing said die to said solder mask, said partially-cured adhesive layer containing one or more adhesive components that cure at or below 100°C.”

Further, combining the APA and Forray as proposed does not result in a semiconductor device assembly having “a solder mask on a substrate,” “a die,” “electrical contacts on said substrate and said die,” each contact on the die “connected to a respective said contact on said substrate,” and “a partially-cured adhesive layer affixing said die to said solder mask, said partially-cured adhesive layer containing one or more adhesive components that cure at or below 100°C.” Instead, applicant respectfully submits that the proposed combination of the APA and Forray provides a device assembly having “a solder mask on a substrate,” “a die,” “electrical contacts on said substrate and said die,” and a cured adhesive layer affixing the die to the solder mask.

Claim 12 is patentable over the proposed combination of the APA and Forray. Claims 14, 16-20, 35, 36, 38, and 40 depend from claim 12 and are patentable over the cited prior art for at least the same reasons.

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In view of the above amendment, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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